We require either striated rock surfaces or boulders, or undoubted *roches moutonnées*, or erratics, which can be proved not to exist sufficiently near to have been brought by "creep" or landslides. In view of these liabilities to error, we may be almost sure that the supposed evidences of glaciation described by the late Mr. Belt in his "Naturalist in Nicaragua" (p. 260), are explicable in the same manner as the Brazilian evidences, since he nowhere found glacial striæ or any boulders that could be proved to be true erratics; and this is the more certain because he himself states (p. 265), "I have myself seen, near Pernambuco, and in the province of Maranham, in Brazil, a great drift deposit that I believe to be of glacial origin."

All students of the past and present history of the earth are indebted to Prof. Branner for having relieved them of a great difficulty—a true glacial nightmare—that of having to explain the recent occurrence of glaciation on a large scale far within the tropics and on surfaces not much elevated above the sea-level. ALFRED R. WALLACE.

Telegony.

DR. ROMANES' letter inviting a discussion concerning the remarkable phenomenon of telegony will be welcomed by many who have felt that too little notice has been paid by men of science up till now to one of the most obscure problems of heredity. At the conclusion of his remarks, Dr. Romanes rejects Prof. Weismann's hypothesis that sperm elements are capable of penetrating into the ovary, and fertilising immature ova *in situ*, on the ground of their obvious incapability of doing so. It seems, however, possible to doubt whether the spermatozoa are so incapable of penetrating such tissues as the stroma surrounding an ovarian follicle. Although, as far as I am aware, the actual penetrating of spermatozoa through ovarian tissues has in no case ever been shown to take place, yet we are bound to take it for granted that in some cases this actually occurs, from facts observed in many Invertebrata.

Prof. Whitman, in an exhaustive paper published in the *Journal of Morphology*, January 1891, has collected a considerable mass of evidence to show that in many widely-differing animal groups the spermatozoa make their way through the external body wall at many different points, usually a large number being bound together to form spermatophores. Perhaps the best examples of animals where this occurs are found among the Turbellarians and Leeches. In these forms the spermatozoa pass directly through the epidermis, basal membrane, and the layers of muscular and connective tissue till they reach the body cavity. Here the spermatophores break up, and in some instances the individual spermatozoa undoubtedly must penetrate the wall of the ovary in order to fertilise the ova *in situ*.

As in many mammals, the immature ova lie very near the surface of the ovary, it does not seem to be beyond possibility that even in the higher vertebrates some similar process may occur.

On the other hand, as Prof. Weismann points out, if such be the case we should expect to find animals pregnant several times in succession after once being crossed, of which no instance has ever been recorded.

Dr. Romanes' suggestion that the followers of Weismann may explain the facts of telegony by supposing the spermatozoa to disintegrate and that their "ids" and "determinants" somehow enter the unripe ova, must for the same reason be dismissed as impracticable, unless it be assumed that enough "ids" never reach one egg to supply the place of those "ids" which have been got rid of by the reducing division of the egg nucleus, and would be replaced in the ordinary course of things by the spermatozoon. Such an assumption would be obviously unscientific and unwarrantable.

It seems, therefore, unsafe, until more definite experimental work has been done with regard to this obscure and interesting problem, to attempt to give any very definite explanation of the facts as they now stand, if we adopt Prof. Weismann's, views as to the continuity of the germ plasm. The facts, as Dr. Romanes very rightly insists upon, show that telegony is on the whole, of very rare occurrence, and on this account it is premature to go so far with Mr. Spencer as to maintain that the few isolated instances of telegony are sufficient to knock down at a blow the far-reaching theories of heredity which Prof. Weismann has put forth. M. D. H.

September 29.

The Use of Scientific Terms.

PROF. LODGE has made a valuable statement regarding scientific terms in last week's NATURE as follows:—"The words used in the current language of biology are extremely classical and as unlike the language of daily life as can be contrived. This is done to keep free from the misunderstandings arising out of the attempt to give to popular words a scientific, *i.e.* an accurate meaning." Botanists have not always been as careful as Prof. Lodge would have us believe, and as an instance to the contrary I would cite the following: I was recently lecturing on forest utilisation, and used the word bark in its ordinary meaning of the outer envelope of a tree. One of the students in the class interrupted me to point out that I was speaking loosely, as *bark* is now a scientific term, meaning the transformed outer envelope of a plant, the German *Borke*, after the growth in it of corky or stony tissues.

I appealed to the sense of the class as to whether botanists have any right to adopt a common English word for something beyond its ordinary meaning, and the class took my view of the subject unanimously, carrying eventually even the objector with them.

The substance now scientifically termed *bark* might be styled *rhytidome*, as is done in France (*vide* "Flore Forestière," by A. Mathieu, edition 1887, p. 595); or can any reader of NATURE propose a better term? W. R. FISHER.

Coopers Hill, October 16.

Rustless Steel.

SOME months ago I noticed, in *The Field*, the statement that steel containing twenty per cent. of nickel was free from rust and, on that account, very suitable for the manufacture of small arms of high quality. From its use in the manufacture of ordnance and armour-plate I presume, moreover, that the nickel alloy does not compare unfavourably with ordinary steel in point of tenacity and hardness.

If this proves to be the case—and it is the object of this letter to elicit the information from some of the numerous readers of NATURE—nickel-steel would form an invaluable material for the construction of certain parts of astronomical and geodetic instruments, notably the pivots and axes, which, as made at present, slowly deteriorate from rust when of steel, or from wear when of bronze. With geodetic instruments, continually set up as they are in exposed situations, sometimes near the sea, it is seldom there is not, after a few years' use, evidence of rust enough on the pivots to have destroyed much of the extreme perfection of figure attained by makers like Repsold or Ertel. The wear of bronze pivots is even worse. I am informed that the earlier meridian observations at a leading observatory are not comparable in accuracy with those taken after the original bronze pivots had been replaced by steel ones.

Cape Town, September 27. H. G. FOURCADE.

RESEARCH LABORATORIES FOR WOMEN.[1]

THE session which we inaugurate to-day will in the future be regarded as of prime importance in the history both of Bedford College and of the higher education of London at large.

It will be remembered in the history of London, for in the course of it the Gresham Commissioners will issue their long-expected report. Whatever the nature of that report may be it will be important; most important if the Commissioners succeed in solving the difficult problem which has been proposed to them, and enlist in favour of their recommendations so strong a sentiment of public approval that a teaching university is at length established on the lines which they lay down. Important, though no doubt less important, if they add to the long list of failures to find the true solution, and thus only prove that another route to the desired end is barred.

As regards Bedford College itself, we meet this session under the shadow of a loss. Miss Martin, for many years the Lady Resident, who has done so much in helping to guide our institution amid the difficulties which have surrounded it, has retired from her post. Many here have already had opportunities of expressing their regrets to her in person, but I feel sure that none interested in Bedford College would wish the first meeting of this session to pass without our conveying to Miss Martin the assurance of the affection with which she has inspired many generations of Bedford College students, or without our telling her once more of our hopes that she may enjoy for many years the rest she has so well earned.

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[1] Inaugural address delivered at the Bedford College for Women, by Prof. A. W. Rücker, F.R.S.

In an inaugural address, however, it is natural to look rather to the future than to the past.

It has been thought well that the organisation of the College should be brought into closer approximation to that which obtains in most similar institutions, whether intended for the education of men or of women. We have now a Lady Principal. It would be impossible in the presence of Miss Penrose to express fully how much we hope from her in the future; it may be sufficient to say that we welcome her as the daughter of a distinguished scholar, and as one who has shown herself capable of climbing the very highest rounds of the ladder of learning. Miss Penrose was selected as Principal by the Council from among a group of candidates, of whom several would have adorned the post, and we believe that the large share in determining the future of Bedford College, which she must now take, has been placed in safe hands.

On the occasion of this new departure it may be well to consider how widely the position of those who are now engaged in working for Bedford College differs from that of its founders.

When the College was first instituted the very principle which it was intended to embody was disputed on all hands. It was denied that the doors of the Temple of Learning should be thrown open to women equally with men; that there is no crypt, however dark, no chapel, however sacred, which may not be entered by both alike.

That principle has now been vindicated. Women are working side by side with men in the same universities, competing with them in the same examinations, and proving by their successes that they can bear a worthy part in the intellectual strife of the schools.

But if in this respect the Council have not to face the prejudices which their predecessors overcame, they have to encounter new difficulties caused in part by the very success of the principle for which their predecessors contended.

Bedford College was the first institution designed for the introduction of women to the higher learning, but unfortunately, or, as the cause is greater than the College, I should perhaps say fortunately, it had no patent rights in the theory which it first illustrated. Rivals, friendly rivals, have sprung up, and in some respects they possess advantages we cannot claim.

Some share the charm of the surroundings and the prestige of the names of the older universities. Another, near London, has wealth to which we have not yet attained. As women's colleges have become more numerous, the beauty of their buildings has increased, the standard of their equipment has improved. To beauty of outward adornment we cannot in York Place pretend, but I would not have dwelt on this point to discourage you. Our laboratories, though small, are well fitted; the art studio, the class and lecture rooms are sufficient for all the claims that are at present made upon them, and we may truly assert that Bedford College, though without the advertisement of external decoration, is adequately equipped for its great task.

Another change which has taken place since Bedford College was founded is in the ideals of those who are engaged in promoting the higher education.

When the College was first inaugurated the great examination craze was at, or was approaching, its height. Since then we have learnt that that method of testing ability is not all-sufficient, and signs are not wanting of a growing disbelief in its efficacy, especially when applied to very advanced students.

The Education Department is laying greater stress on inspection and less on examination. In the University of London the note-books of the work done by scientific students in the laboratory are submitted to the examiners, thus recognising work done outside the examination room.

At Cambridge the Smith's prizes are given for successful theses instead of after an examination test.

To have completed an original research now carries a man further towards his fellowship than all the triumphs of the Schools.

In the University of London the degree of Doctor of Science is given without further examination, if the candidate can prove that he has added to knowledge on the subject he professes.

I am told that there is at present a movement on foot at Oxford for giving to those who have carried out a successful research, what is still to some Englishmen almost inconceivable, an examinationless degree.

It is perhaps chiefly in the mathematical and physical sciences that this movement is most noticeable, and it is largely based upon the growing conviction of both teachers and students, that it is, if not useless, at all events unsatisfactory to master all the intricacies of a mathematical or experimental machinery for investigating nature, if the knowledge gained with much pain and labour is not turned to account.

Every man who has solved a mathematical problem has done work which is, as far as he is concerned, original, and it is absurd to train men so as to endow them with a special facility for such work, and yet to do nothing to show them in what direction their exceptional attainments may be of real service.

A student who has mastered a science but complains that he can add nothing to knowledge, is like an athlete who has learned to run well on a cinder track, but fails on the high road.

More and more stress, then, is now being laid on the power both of teacher and students to use their knowledge. It is no exaggeration to say that original papers are produced in the principal London colleges by the score. If we turn to the provinces we find that the Commissioners of the 1851 Exhibition give scholarships to those among the provincial students whom their colleges recommend as capable of undertaking advanced scientific work. And here it may be noticed that examination has again been dispensed with. In the old days the candidates would have been selected after a centralised examination held in London, whereas now the Commissioners are content—and, in my opinion, very properly content—with the recommendation of responsible authorities.

In view then of this great change in the aims and objects of the higher education, I want to impress upon you that fact that if Bedford College, if women's colleges in general are to hold the high position which the success of their students in the examination room has won for them, they must become places, not merely for acquiring knowledge, but for adding to it. I do not think that it can be honestly said that up to the present time the success of women as investigators has, in spite of some notable exceptions, been as great as their rapid and extraordinary achievements as students would have led us to expect. Nevertheless, if the fundamental idea of our founders is to govern us in the future as it has guided us in the past, the students of Bedford College must distinguish themselves in the research laboratory as they have often distinguished themselves in the struggle for a degree. In undertaking this task, many of them possess one qualification for success which most men lack: they have, at all events, time at their disposal.

Do not let me be misunderstood. I am far from desiring that the students of Bedford College should leave its walls impressed only with the importance of adding to knowledge, and inclined to neglect other and, at least as urgent duties. In my opinion, no man or woman can afford to cultivate any one part of their nature to the exclusion of the others. Sad stories have sometimes been told of homes in which work has been done which will never be forgotten, but done at the cost of all the brightness and happiness which are usually associated with the name of home. This want of the sense of proportion, of the relative importance of different claims, casts a shadow on the brightest intellectual fame. I am not asking for such sacrifices. I believe that in general they are absolutely unnecessary. But where the over-mastering curiosity of the born investigator exists, it will find a career, which may indeed involve self-sacrifice, but which need make no harsh demand on others.

There are, to my knowledge, at the present moment a large class of men who are living more hardly than they otherwise might live, who are cheerfully surrendering days which might be given to pleasure or to money-making, and are spending laborious nights, simply because they are impelled by the desire to add something to the pile of knowledge which our race is through the centuries accumulating. It cannot but be that if the same spirit animated the women and girls of this generation, many would be found among them who, without neglecting any duty, would work with the same energy for the same object.

It is possible that some of my hearers may accuse me of holding up an impossible ideal. My answer is that the founders of Bedford College held up to their generation an ideal which was then regarded as impossible but which has nevertheless been realised. Women, if they please, can now be educated to the same high level as men. I in turn venture to hold up to you an ideal at which Bedford College should aim in the future. It is that it should be known as a place of learning as well as a place of education, as a place where not only is the number of those who know added to, but where knowledge itself is increased.

THE INNER STRUCTURE OF SNOW CRYSTALS.

THE ice and snow crystals photographed and described by me[1] may be referred to the following types.

I. Crystals developed in the direction of the vertical axis. (*a*) Hexagonal prisms. (*b*) Bottle-shaped prisms. (*c*) Needles.

II. Tabular crystals. (*a*) Hexagonal tables. (*b*) Stellated tables. (*c*) Dendritic tables.

III. Crystals equally developed along the vertical and lateral axes.

Among these groups, types I. (*c*) and III. are in no way different from the ordinary hexagonal crystals, and accordingly of less general interest. The former, I. (*c*), is common in drifting snow; to the latter belong the sharp edged hexagonal prisms *without cavities*, which compose the under layers of the snow covering. They are never found among the snowflakes, and are accordingly originated by a molecular change in the snow covering. Type II. (*c*) comprises the relatively large dendritic crystals with complicated ramifications which are visible even to the naked eye as handsome regular stars. They have been figured and described by several observers, from Claus Magnus and Keppler to Scoresby and Glaisher, and I shall therefore not dwell upon them in the present paper. Of the remaining extremely interesting types (I. *a*, *b*; II. *a*, *b*), which, owing to their microscopic dimensions, have hitherto received no attention from men of science, I give a brief description.

I. (*a*) *Hexagonal Prisms.*

Fig. 1 shows the commonest type. It is bounded by the basal planes and the hexagonal prism, and of interest on account of the *hour-glass shaped cavities* invariably present within the crystal. These are, as shown by the figure, widest near the two basal planes, where they are bounded by a negative hexagonal prism; nearer the centre they contract again to expand in the form of two bulbs, elongated to points and confluent. The shape of the cavities is almost always the same. Crystals of this type are very small (about 0·5 mm. long), and the inner structure only distinguishable under the microscope. They are common in drifting snow.

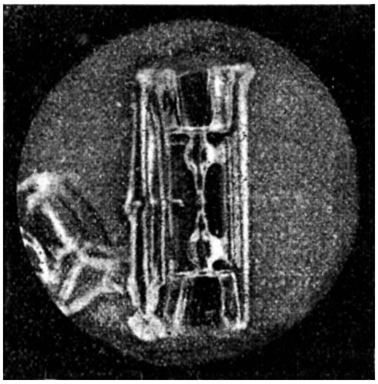

FIG. 1.

I. (*b*) *Bottle-shaped Prisms.*

The bottle-shaped crystals of elongated prismatic form have the appearance shown in Fig. 2. Like the crystals of the preceding type, they are bounded by an hexagonal prism and the basal plane; but one end is pointed, and the crystals accordingly hemimorphic. The bottle-shaped crystals also contain cavities, less regular, however, than those in the crystals of the preceding type. The following circumstance attaches a special interest to these crystals. On February 8 there was a rather sparse fall of agglomerations of bottle-shaped crystals such as are shown in Fig. 2. *The cavities in these crystals proved under the microscope to*

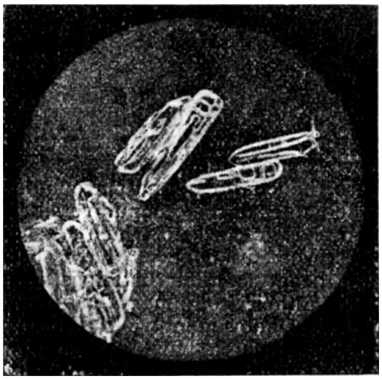

FIG 2.

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[1] "Geol. Foren. i Stockh." Forh. Bd. 15, p. 146.